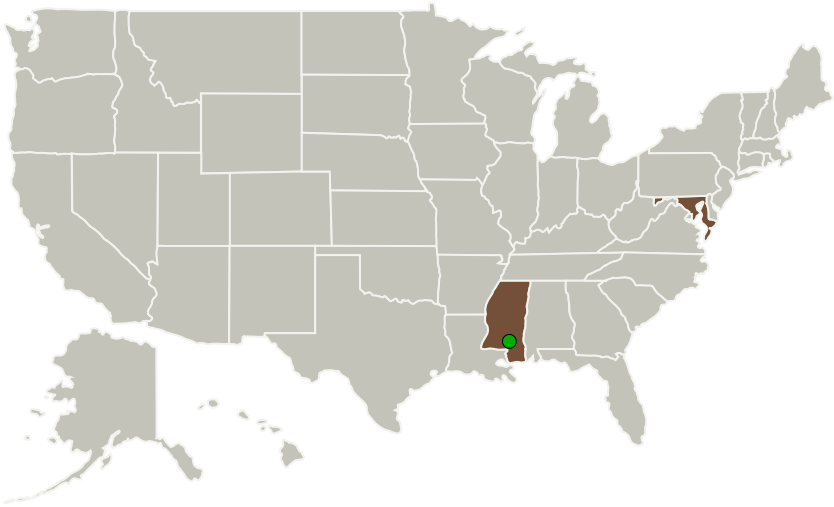
A Labview System with Novel and Advanced Prognostic Tools, Phase I

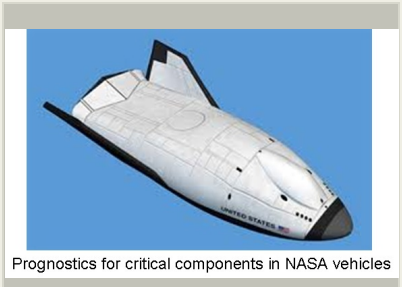
Completed Technology Project (2013 - 2013)

Project Introduction

We propose a portable data acquisition and prognostic system that contains both hardware and software with several innovative ideas. First, our hardware system consists of a high speed data acquisition card and a portable lunchbox PC. The portable lunchbox PC has advanced prognostics algorithms and user friendly Graphical User Interface (GUI) for displaying component fault status and trends. Second, the prognostics software has several innovative algorithms, which will be implemented in Labview. The first one is an adaptive physics based prognostic tool. The idea is motivated by damage mechanics, which associates the vibration amplitude and natural frequency of the vibration to the damage status. This idea has been experimentally proven to be very accurate in bearing failure prediction. The second prognostic tool is data driven and is a Hidden Markov Model (HMM) based approach that can predict the degraded state of the system. Tests using experimental data showed that the various degraded states can be correctly and unambiguously identified by the algorithm. The third tool is a hybrid one and was proven to achieve very high performance in the 2008 PHM Challenge. Finally, to further enhance the prognostic performance, we propose to apply Dempster Shafer algorithm to perform prognostic fusion.

Primary U.S. Work Locations and Key Partners





Prognostics for critical components in NASA vehicles

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Organizations Performing Work	Role	Type	Location
Signal Processing, Inc.	Lead Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB), Women-Owned Small Business (WOSB)	Rockville, Maryland
Stennis Space Center(SSC)	Supporting Organization	NASA Center	Stennis Space Center, Mississippi

Primary U.S. Work Locations	
Maryland	Mississippi

Project Transitions

May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137823)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Signal Processing, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

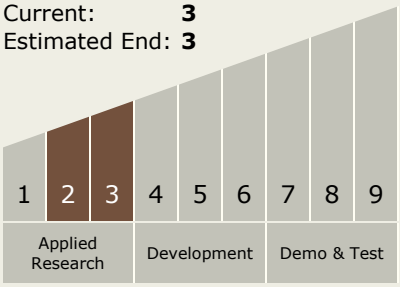
Carlos Torrez

Principal Investigator:

Chiman Kwan

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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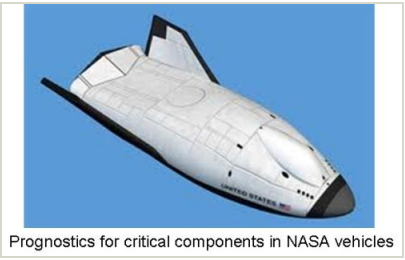
Images


Prognostics for critical components in NASA vehicles

Project Image
A Labview System with Novel and Advanced Prognostic Tools
(https://techport.nasa.gov/image/136103)

Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
  - TX13.1 Infrastructure Optimization
    - TX13.1.2 Launch/Test/Ops Site Management

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System